REMARKS

By this amendment, claims 1, 4 and 13 have been amended, and claims 10-12 are cancelled. Thus, claims 1-9 and13-17 are now active in the application. Reexamination and reconsideration of the application are respectfully requested.

In item 2 on page 2 of the Office Action, claims 10 and 11 were objected to as being substantial duplicates of claims 3 and 8, respectively. In order to obviate this objection, claims 10 and 11, as well as claim 12 which depended from claim 11, have been cancelled.

In items 3-11 on pages 2-7 of the Office Action, claims 1, 2 and 4 were rejected under 35 USC § 102(e) as being anticipated by Park et al. (US 7,100,743); claim 4 was rejected under 35 USC § 103(a) as being unpatentable over Park et al. in view of Andrione et al. (US 4,386,859); claims 1, 3, 8, 10 and 11 were rejected under 35 USC § 103 (a) as being unpatentable over Park et al. in view of Andrione et al (US 4,493,226); claims 5, 9 and 12 were rejected under 35 USC § 103(a) as being unpatentable over Park et al. in view of Andrione et al. '859 and further in view of Andrione '226; claims 13-16 were rejected under 35 USC § 103(a) as being unpatentable over Park et al. in view of Andrione et al. '859 and further in view of Andrione '226; claim 15 was rejected under 35 USC § 103(a) as being unpatentable over Park et al. in view of Andrione '859 and Andrione '226 and further in view of Khoo et al (US 5,842,420); and claims 6 and 7 were rejected under 35 USC § 103(a) as being unpatentable over Park et al.

These rejections are believed to clearly inapplicable the claims are now amended for the following reason.

With exemplary reference to the drawing figures, claim 1 sets forth a reciprocating compressor comprising: a motor unit 21; a compressing unit 22 disposed over the motor unit 21 and including a compression chamber 38; a piston 32 disposed for reciprocation in the compression chamber 28, and a crankshaft 24 configured to convert rotating action of the motor unit 21 into reciprocating action of the piston 32. The reciprocating compressor of claim 1 is further required to include an enclosed container 18 accommodating the motor unit 21 and the compressing unit 22 and having a lubricant oil pooling portion (i.e. bottom portion in Fig. 1) configured to pool lubricant oil. The crankshaft 24 of claim 1 is required to include a centrifugal

pump (e.g. slant path 42) disposed at a lower section of the crankshaft 24 and opening into the lubricant oil pooling portion of the container 18, a pair of spiral pumps 43A, 43B, functionally independent, disposed at a middle section of the crankshaft 24, fluidically connected with the centrifugal pump (e.g. 42), and having leading grooves 43A, 43B running in opposite directions to each other. Claim 1 further requires that the spiral pumps 43A, 43B have upper ends and lower ends (as shown in Fig. 2), and that the centrifugal pump 42 is fluidically connected with the spiral pumps 43A, 43B only at the lower ends thereof via one communicating section 44. In addition, claim 1 specifies that a pair of vertical holes 45A, 45B, functionally independent, are provided at an upper section of the crankshaft 24, open into the container 18, and are fluidically connected with the spiral pumps 43A, 43B.

Thus, with the amendment to claim 1, claim 1 specifies that the first spiral pump grooves 43A, 43B respectively have upper ends and lower ends, and that centrifugal pump 42 is fluidically connected with the spiral pumps 43A, 43B only at the lower ends thereof via one communicating section 44, as clearly illustrated in Fig. 2.

In contrast to the present invention as recited in claim 1, Fig. 15 of the Park et al. patent, clearly shows that the spiral pumps 342a (343a, 343b) are fluidically connected with the centrifugal pump 340 (via shaft oil hole 341) not only at the lower ends of the spiral pumps (342a), but also at the upper ends of the spiral pumps (342b). Therefore, it can not be said that the centrifugal pump 340, 341 of Park et al. is fluidically connected with the spiral pumps 343a, 343b only at the lower ends thereof via one communicating section, as required by claim 1.

During normal rotation of the compressor disclosed in the Park et al. patent, some of the oil from the shaft oil hole 341 flows up to the helical grooves 343a via the connection holes 342a and reaches the connection hole 342b. In addition, some of the oil from the shaft oil hole 341 flows up to the connection holes 342b via the shaft oil hole 341. That is, oil entering into the shaft oil hole 341 flows up to the location of the upper connection holes 342b along both a first path (directly upwardly through the shaft oil hole 341) and a second path (along the helical grooves 343a, 343b). The portion of the oil that flows upwardly via the helical grooves 343a, 343b is carried due to the viscosity of the oil, as well as the shape of the helical grooves 343a,

343b and centrifugal force. A second portion of the oil that flows directly through the shaft oil hole 341 is carried upwardly due to centrifugal force along the inner diameter of the shaft oil hole 341. Thus, the oil flowing up through the shaft oil hole 341 collects along the walls of the shaft oil hole 341, with little oil at the center of the shaft oil hole 341. This oil gathering along the wall of the shaft oil hole 341 is pulled downwardly by gravitational force thereby resulting in less oil flowing to the upper part of the shaft oil hole 341. The upward flow of oil along the helical grooves 343a, 343b is aided by the good carrying ability of the helical groove, and thus, some of the oil flows up to the pin oil holes 344a. However, since there is little oil at the center of the shaft oil hole 341, as mentioned above, a certain portion of the oil carried by the helical grooves is also pulled down by gravitational force within the oil hole 341. Therefore, not all of the oil carried via the helical groove reaches the pin oil holes 344a. This results in an insufficient supply of oil to upper locations of the sliding portions, and the amount of oil discharged and scattered within the hermetic container is relative small. This same phenomenon occurs in either rotating direction.

In contrast to the above-described flow of oil in the Park et al arrangement, the spiral pumps 43A, 43B of the present invention are fluidically connected with the centrifugal pump 42 only at the communication section 44 at the lower ends of the spiral pumps 43A, 43B. Therefore, all of the oil carried upwardly by the centrifugal pump 42 and one of the spiral pumps (e.g. 43A) under normal rotation, is further carried up along an eccentric path (45A). Due to this, the sliding portions of the compressor are supplied with sufficient oil.

Thus, the structure of the present invention as recited in claim 1, as well as the effects provided thereby, are significantly different than in the arrangement of the Park et al patent.

Thus, for the above reasons, it is believe apparent that claim 1 is not anticipated by the Park et al. patent. Furthermore, it is submitted that none of the Andrione '859, Andrione '226 and Khoo et al. references provides any teaching or suggestion that would have made it obvious to a person of ordinary skill in the art to modify the arrangement of Park et al. or to make any combination of the references of record in such a manor as to result in or otherwise render

obvious the present invention of claim 1. Therefore, it is submitted that claim 1, as well as claim 2-9 which depend therefrom, are clearly allowable over the prior art of record.

Claim 13 is amended in a similar manner to claim 1. Thus, with exemplary reference to the drawing figures, independent claim 13 sets forth a reciprocating compressor comprising: an enclosed container 18 having a lubricant oil pooling portion to allow for pooling of lubricant oil 23 therein; a motor unit 21 disposed in the container 18; a compressing unit 22 disposed in the container 18 over the motor unit 21 and being arranged to be driven by the motor unit 21; wherein the compressing unit 22 includes a cylinder block 29, a compression chamber 28 formed in the cylinder block 29, a piston 32 disposed for reciprocation in the compression chamber 28, and a crankshaft 24 operably coupled to the piston 32 and the motor unit 21 to cause reciprocation of the piston 32 upon rotating action of the motor unit 21; wherein the crankshaft 24 includes a lower, main section 27 coupled with the motor unit 21, a middle, eccentric section 25 disposed above the main section 27 and coupled to the piston 32, and an upper, sub-shaft section 26 disposed above the eccentric section 25; wherein a lower, main bearing 31 is provided about the main section 27 of the crankshaft 24 to rotatably support the crankshaft 24 at the main section 27 thereof; wherein an upper, sub bearing 30 is provided about the sub-shaft section 26 of the crankshaft 24 to rotatably support the crankshaft 24 at the sub-shaft section 26 thereof; wherein the crankshaft 24 has a fluid suction path 42 formed therein and opening into the lubricant oil pooling portion of the container 18; wherein the main section 27 of the crankshaft has a pair of first spiral pump grooves 43A, 43B formed in an outer surface thereof, the first spiral pump grooves 43A, 43B being fluidically connected to the fluid suction path 42 and being functionally independent of one another; wherein the eccentric section 25 of the crankshaft 24 has a pair of vertical holes 45A, 45B formed therein, the vertical holes 45A, 45B being fluidically connected to the first spiral pump grooves 43A, 43B, respectively, and the vertical holes 45A, 45B being functionally independent of one another; wherein the first spiral pump grooves 43A, 43B respectively have upper ends and lower ends (as shown in Fig. 2), and the fluid suction path 42 is fluidically connected with the first spiral pump grooves 43A, 43B only at the lower ends thereof via one communicating section 44; wherein the sub-shaft section 26 of the

crankshaft 24 has a pair of second spiral pump grooves 48A, 48B formed in an outer surface thereof, the second spiral pump grooves 48A, 48B being functionally independent of one another and operable to pump the lubricant oil upwardly; and wherein the second spiral pump grooves 48A, 48B are fluidically connected to the vertical holes 45A, 45B, respectively, such that a first one (e.g. 45A) of the vertical holes is arranged to independently feed lubricant oil 23 from a first one (e.g. 43A) of the first spiral pump grooves to a first one (e.g. 48A) of the second spiral pump grooves, and such that a second one (e.g. 45B) of the vertical holes is arranged to independently feed lubricant oil 23 from a second one (e.g. 43B) of the first spiral pump grooves to a second one (e.g. 48B) of the second spiral pump grooves.

Thus, independent claim 13, similarly to independent claim 1, now specifies that the first spiral pump grooves 43A, 43B have upper and lower ends, and that the fluid suction path 42 is fluidically connected with the first spiral pump grooves 43A 43B only at the lower ends thereof via one communicating section 44, as clearly illustrated in Fig. 2.

Thus, with this amendment to claim 13, it is submitted that the structure recited in claim 13, as well as the effects thereof, differ from the prior art arrangements of record for the same reasons as set forth above in support of claim 1. Therefore, it is respectfully submitted that claim 13, as well as claims 14-17 which depend therefrom, are also clearly allowable over the prior art of record.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is earnestly solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, it is respectfully requested that the Examiner contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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May 9, 2007